FCC TEST REPORT

REPORT NO.: SE08FCI20BR

MODEL NO.: ESP-GEN2-04

LISTED MODELS: N/A

RECEIVED: Dec 25, 2008

TESTED: Jan 10 to Jan 15, 2009

APPLICANT: ESP SYSTEMS, LLC.

ADDRESS: 401 N. Tryon St-10th Floor, Charlotte, North Carolina 28202 United States

ISSUED BY: SHENZHEN SETEK TECHNOLOGY CO., LTD.

LAB LOCATION: 2/F,A3 Bldg, East Industry Zone, Overseas Chinese Town, Shenzhen,China

SHENZHEN SETEK TECHNOLOGY CO., LTD.

Our website: www.setek.com.cn **E-mail:Service@setek.com.cn**

TEL:86-755-26966362 **FAX: 86-755-26966270**

Prepared for	:	ESP SYSTEMS, LLC.
Address	:	401 N.Tryon St-10th Floor, Charlotte, North Carolina 28202 United States
Product	:	HUBLITE
Model No(s).	:	ESP-GEN2-04
Trademark	:	N/A
Test Standard	:	FCC Part 15 Paragraph 15.249
Prepared by	:	SHENZHEN SETEK TECHNOLOGY CO., LTD.
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Prepared by	:	(Engineer)
Reviewer by	:	(Project Engineer)
Approved by	:	(Manager)

Report Number	:	SE08FCI20BR
Date of Test	:	Jan 10 to Jan 15, 2009
Date of Report	:	Mar 11, 2009

The device described above is tested by SHENZHEN SETEK TECHNOLOGY CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. This report applies to above tested sample only and shall not be reproduced in part without written approval of SHENZHEN SETEK TECHNOLOGY CO., LTD.

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

Applicant	:	ESP SYSTEMS, LLC.
Address	:	401 N.Tryon St-10th Floor, Charlotte, North Carolina 28202 United States
Manufacturer	:	ESP Technology (Shenzhen) Ltd.
Address	:	East wing, 3rd Floor, Block 2, Phase 1 of Vision Shenzhen Business Park Keji South Rd., Shenzhen Hi-Tech Industrial Park, Shenzhen
EUT	:	HUBLITE
Model Number(s)	:	ESP-GEN2-04
Description of Antenna	:	PCB Antenna
Power Supply	:	AC 120V/60Hz Adaptor
Operation Frequency	:	2405MHz-2480 MHz
Number of Channels	:	16
Type of Modulation	:	FHSS
Received	:	Dec 25, 2008
Date of Test	:	Jan 10 to Jan 15, 2009

1.2 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 25GHz)	FCC PART 15: Oct 2007	ANSI C63.4: 2003	Class B	PASS
Conducted Emission (150KHz to 30MHz)	FCC PART 15: Oct 2007	ANSI C63.4: 2003	Class B	PASS

1.3 Description of Support Device

The EUT has been tested as an independent unit.

1.4 Standards Applicable for Testing

The customer requested FCC tests for a HUBLITE. The standards used were FCC 15 Paragraph 15.249, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

1.5 List of Measuring Equipments Used

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI	100106	2008/11
2	ARTIFICIAL MAINS	ROHDE & SCHWARZ	ESH2-Z5	100028	2008/11
3	PULSE LIMITER	ROHDE & SCHWARZ	ESHSZ2	100044	2008/11
4	EMI TEST SOFTWARE	ROHDE & SCHWARZ	ES-K1 1.71	N/A	2008/11

Radiated Emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2008/11
2	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2008/11
3	RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	2008/11
4	TURNTABLE	ETS	2088	2149	2008/11
5	ANTENNA MAST	ETS	2075	2346	2008/11
6	EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	N/A	2008/11

1.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC – Registration No.: 662850

Shenzhen Huatongwei International Inspection Co., Ltd, the EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission.

1.7 Measurement Uncertainty

Radiation Uncertainty : Ur = ±4.22dB

Conduction Uncertainty : Uc = ±3.29dB

2. Conducted Emission Test

Product Name:	HUBLITE
Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	Jan 11, 2009
Frequency Range:	150 kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9 kHz Resolution Bandwidth) Quasi-Peak & Average if maximized peak within 6dB of Average Limit

2.1. Test Equipment

Please refer to Section 1.5. this report.

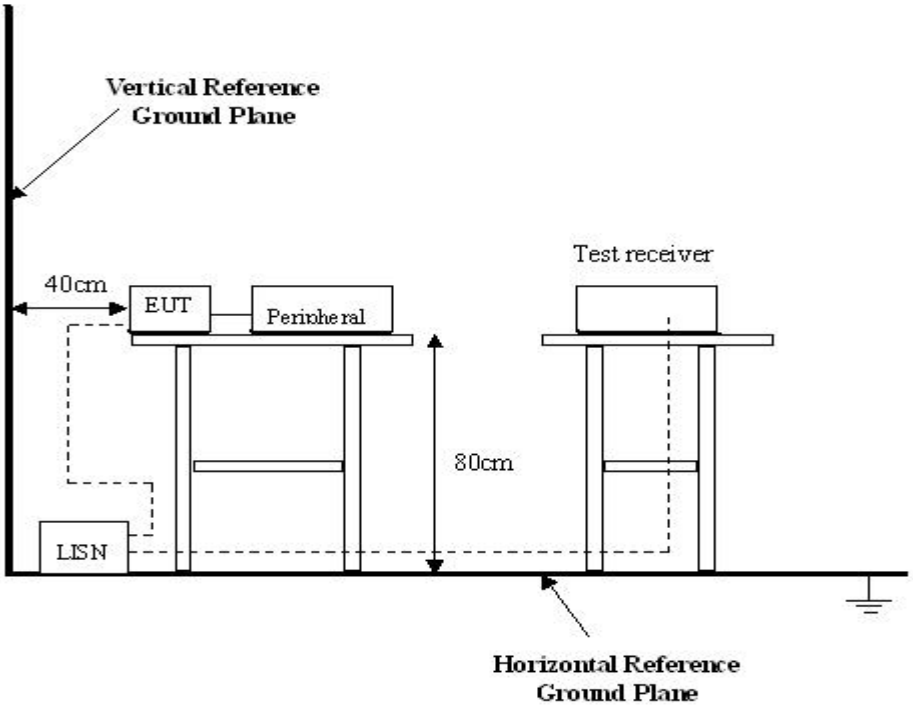
2.2. Test Procedure

1. The EUT was tested according to ANSI C63.4: 2003. The frequency spectrum from 150kHz to 30MHz was investigated.

2. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

2.3. Conducted Test Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



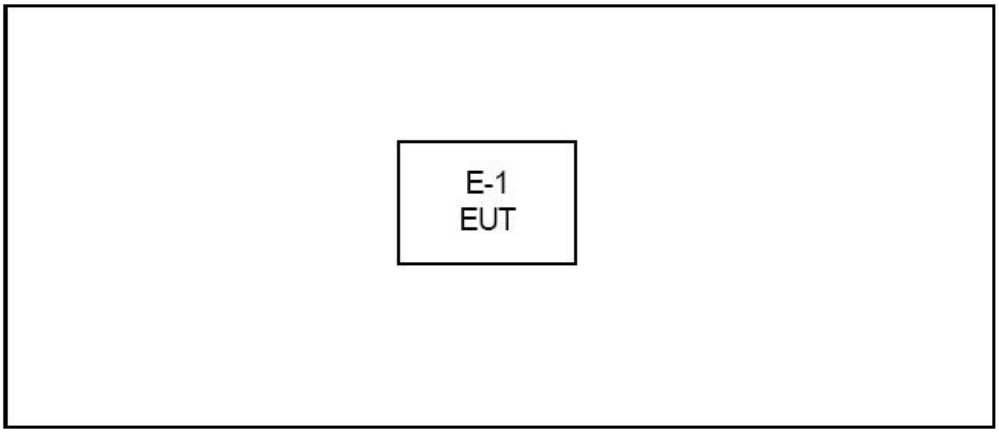
2.4. EUT Operating Condition

Operating condition is according to ANSI C63.4: 2003.

A. Setup the EUT and simulators as shown on follow.

B. Enable RF signal and confirm EUT active.

C. Modulate output capacity of EUT up to specification.



2.5. Conducted Emission Limits

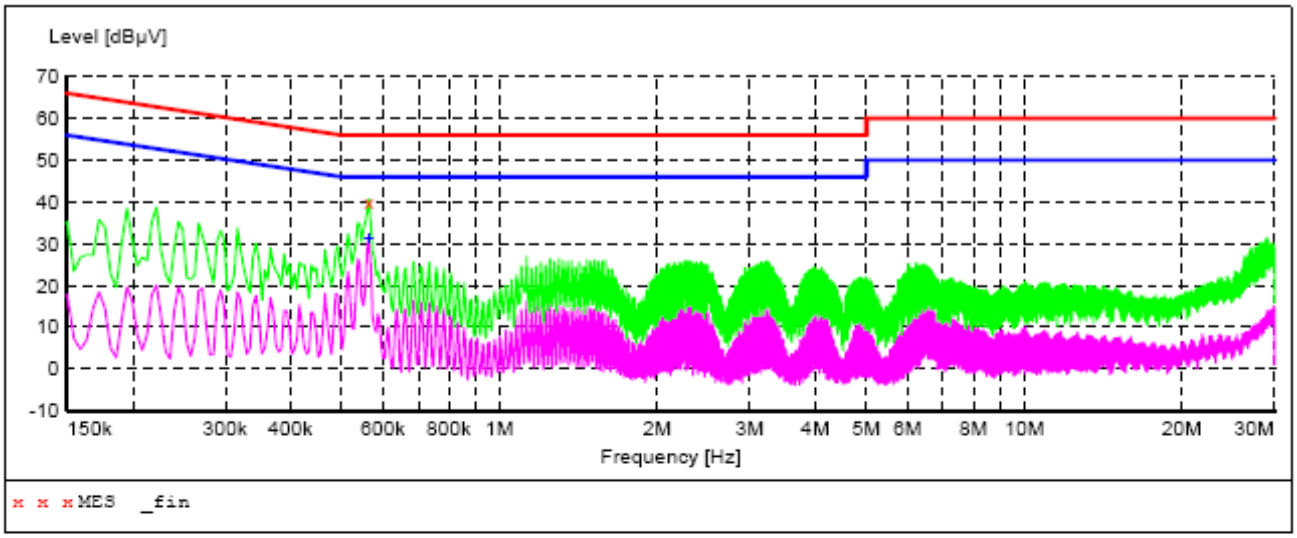
66-56 dBuV/m between 0.15MHz & 0.5MHz
56 dBuV/m between 0.5MHz & 5MHz
60 dBuV/m between 5MHz & 30MHz

Note: In the above limits, the tighter limit applies at the band edges.

2.6. Test Result

See the following pages

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



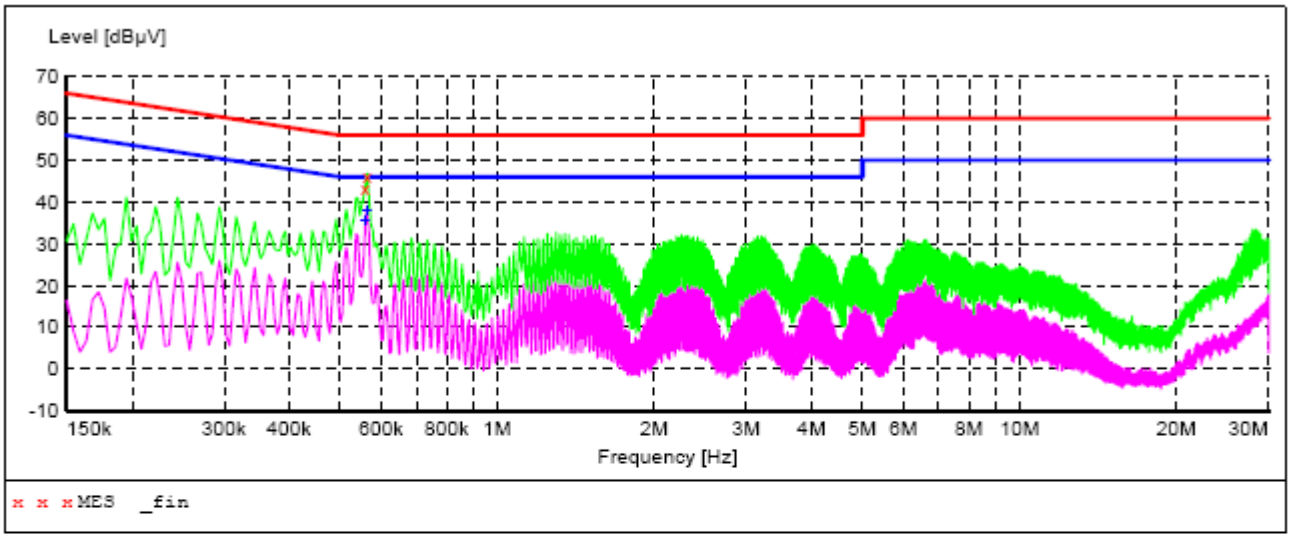
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.564000	39.90	10.5	56	16.1	QP	N	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.564000	31.20	10.5	46	14.8	AV	N	GND

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.559500	43.20	10.5	56	12.8	QP	L1	GND
0.564000	46.30	10.5	56	9.7	QP	L1	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.559500	35.60	10.5	46	10.4	AV	L1	GND
0.564000	38.00	10.5	46	8.0	AV	L1	GND

3 Radiation Emission Test

Product Name:	HUBLITE
Test Requirement:	FCC Part15 Paragraph 15.249
Test Method:	Based on FCC Part15 Paragraph 15.31 and Paragraph 15.33
Test Date:	Jan 11, 2009
Frequency Range:	30MHz to 25GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth)
	Quasi-Peak if maximised peak within 6dB of limit

3.1. Test Equipment

Please refer to Section 1.5. in this report.

3.2. Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase centre variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on ANSI C63.4: 2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at EMC Lab is ±3.84 dB.

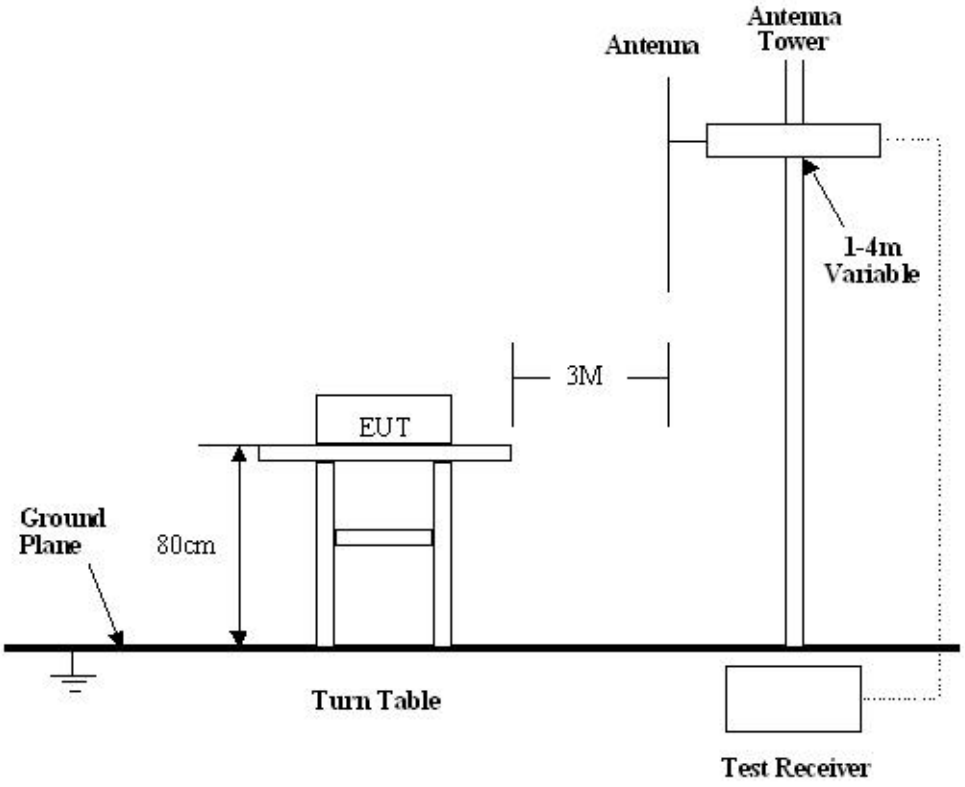
3.3. Test Procedure

1. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
2. All data was recorded in the peak detection mode.
3. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

4. According to the FCC Part 15 Paragraph 15.205, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a PCB antenna, fulfill the requirement of this section.

3.4. Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003, The specification used in this report was the FCC Part15 Paragraph 15.249 and Paragraph 15.209 limits.



3.5. Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.249 Rules, the system was tested to 25000 MHz.

Start Frequency..... 30 MHz
Stop Frequency..... 25000 MHz
Sweep Speed .....Auto
IF Bandwidth..... 100 kHz
Video Bandwidth..... 1 MHz
Quasi-Peak Adapter Bandwidth ..... 120 kHz
Quasi-Peak Adapter Mode ..... Normal
Resolution Bandwidth 1MHz

3.6. Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBuV means the emission is 7dBuV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

3.7. Summary of Test Results

According to the data in section 7.10, the EUT complied with the FCC Part15 Paragraph 15.249 standards.

3.8. EUT Operating Condition

Same as section 6.4 of this report.

3.9. Radiated Emissions Limit

A. FCC Part 15 subpart C Paragraph 15.249 Limit

Fundamental Frequency	Field Strength of Fundamental		Field Strength of Harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25GHz	250	108	2500	68

Note: (1) RF Voltage(dBuV)=20 log RF Voltage(uV)

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(3)The emission limit in this paragraph is based on measurement instrumentaion employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

(4) Limit fundamental is 94dBuV/m@3m(AV)and114dBuV/m@3m(PK)

Limit field strength of harmonics: 54 dBuV/m@3m(AV)and74dBuV/m@3m(PK)

B. Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: (1) RF Voltage(dBuV)=20 log RF Voltage(uV)

(2) In the Above Table, the tighter limit applies at the band edges.

(3) Distance refers to the distance in meters between the measuring instrument antenna.

3.10. Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding The meter reading of the spectrum analyzer (which is set to read in units of dBuV) To the antenna correction factor supplied by the antenna manufacturer. The antenna Correction factors are stared in terms of dB. The gain of the pressletor was accounted For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

Radiated Emission Test Data

Test Voltage: AC 120V/60Hz

Test Mode: Normal Working

Temperature: 24 °C

Humidity: 52%RH

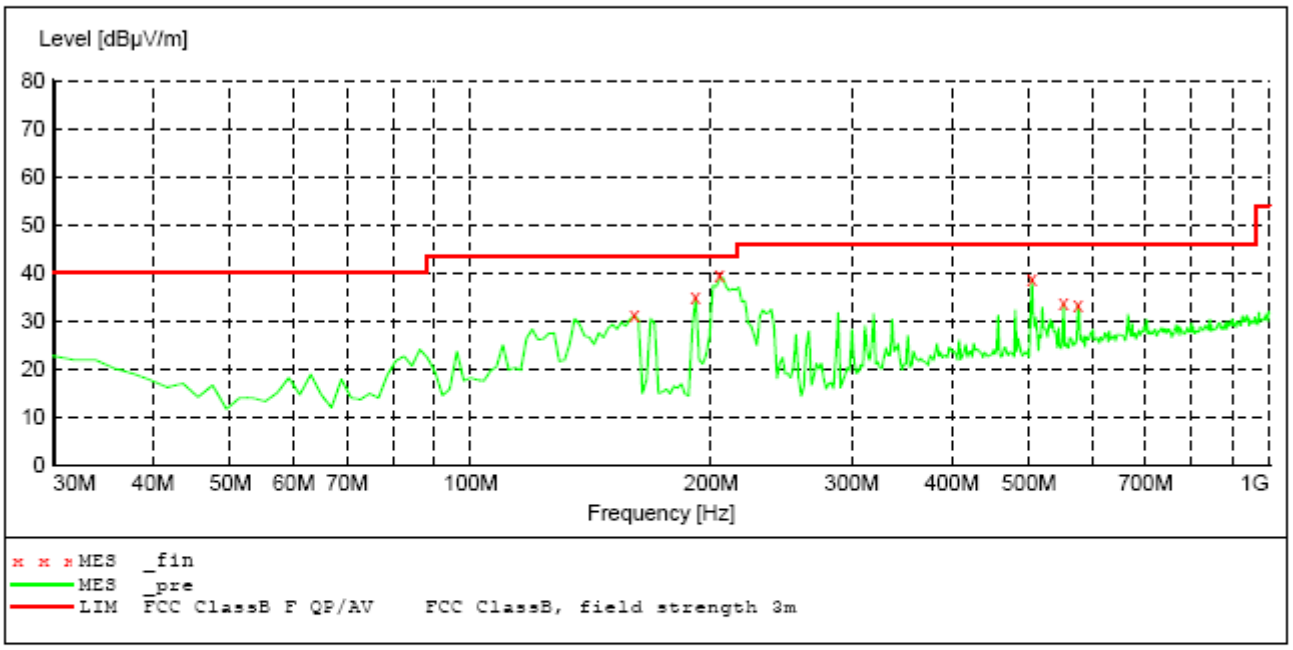
Test Result: PASS

Remarks: No further spurious emission found between lowest internal generated/used frequency to 30 MHz

30MHz-1GHz Radiation emission test:

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	120 kHz	HL562 08

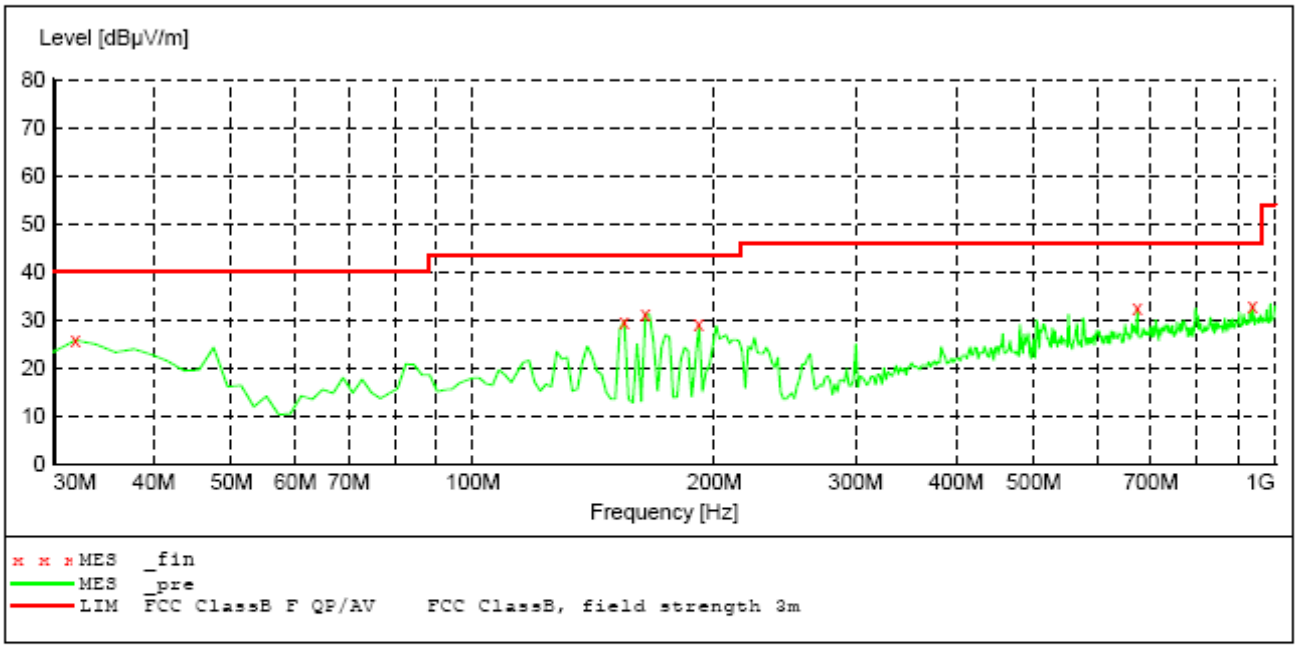


MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
160.240000	31.10	10.4	43.5	12.4	QP	300.0	99.00	HORIZONTAL
191.340000	35.00	11.0	43.5	8.5	QP	100.0	237.00	HORIZONTAL
204.950000	39.70	10.9	43.5	3.8	QP	100.0	267.00	HORIZONTAL
504.300000	38.80	20.2	46.0	7.2	QP	100.0	63.00	HORIZONTAL
552.900000	33.60	21.6	46.0	12.4	QP	100.0	237.00	HORIZONTAL
576.230000	33.50	22.2	46.0	12.5	QP	100.0	296.00	HORIZONTAL

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	120 kHz	HL562 08



MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.940000	25.80	20.1	40.0	14.2	QP	100.0	98.00	VERTICAL
154.400000	29.70	10.6	43.5	13.8	QP	100.0	39.00	VERTICAL
164.120000	31.40	10.6	43.5	12.1	QP	100.0	39.00	VERTICAL
191.340000	29.00	11.0	43.5	14.5	QP	100.0	299.00	VERTICAL
673.430000	32.30	23.7	46.0	13.7	QP	100.0	360.00	VERTICAL
937.790000	33.10	25.5	46.0	12.9	QP	100.0	3.00	VERTICAL

Above 1GHz Radiation emission test:

Top Channel:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2480	V	Peak	89.10	-3.30	85.80	93.98	-8.18	F
2480	H	Peak	86.80	-3.30	83.50	93.98	-10.48	F
4960	V	Peak	46.40	3.90	50.30	73.98	-23.68	H
4960	H	Peak	39.20	3.90	43.10	73.98	-30.88	H
7440	V		---					H
7440	H		---					H
Others			---					

Middle Channel:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2445	V	Peak	88.50	-3.40	85.10	93.98	-8.88	F
2445	H	Peak	88.70	-3.40	85.30	93.98	-8.68	F
4890	V	Peak	46.80	3.70	50.50	73.98	-23.48	H
4890	H	Peak	40.70	3.70	44.40	73.98	-29.58	H
7335	V		---					H
7335	H		---					H
Others			---					

Bottom Channel:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2405	V	Peak	89.90	-3.50	86.40	93.98	-7.58	F
2405	H	Peak	88.30	-3.50	84.80	93.98	-9.18	F
4810	V	Peak	44.60	3.80	48.40	73.98	-25.58	H
4810	H	Peak	39.10	3.80	42.90	73.98	-31.08	H
7215	V		---					H
7215	H		---					H
Others			---					

NOTE:

A Measuring frequencies from 30 MHz to the 25 GHz.

B "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.

C * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

D Data of measurement within this frequency range shown "--- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

E The IF bandwidth of EMI Test Receiver was 120KHz for measuring from 30 MHz to 1 GHz and 1 MHz for measuring above 1 GHz

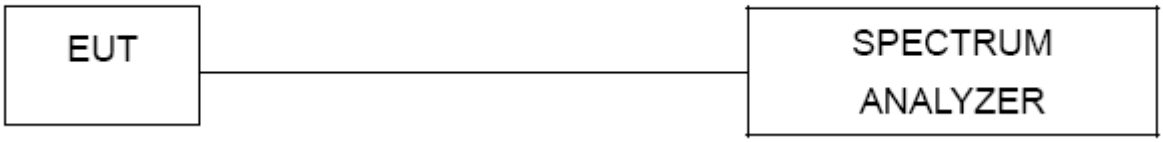
4 Band Edge

4.1. Test Equipment

Please refer to Section 1.5. this report.

4.2. Test Procedure

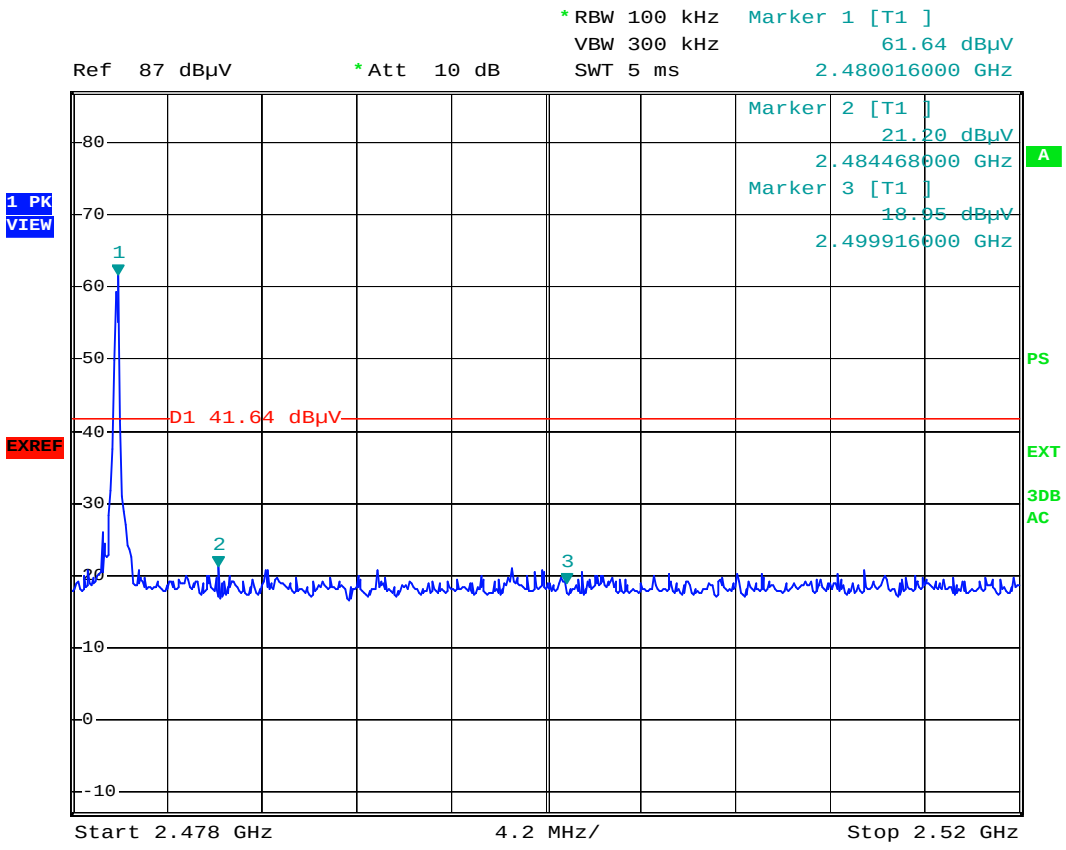
1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below:



2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 1MHz RBW and 1MHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

4.3. Test Result

Product Name:	HUBLITE
Test Item:	20dB Band Edge Test
Test Voltage:	DC 12V by the Adaptor
Mode:	TX On
Temperature:	24 °C
Humidity:	52%RH



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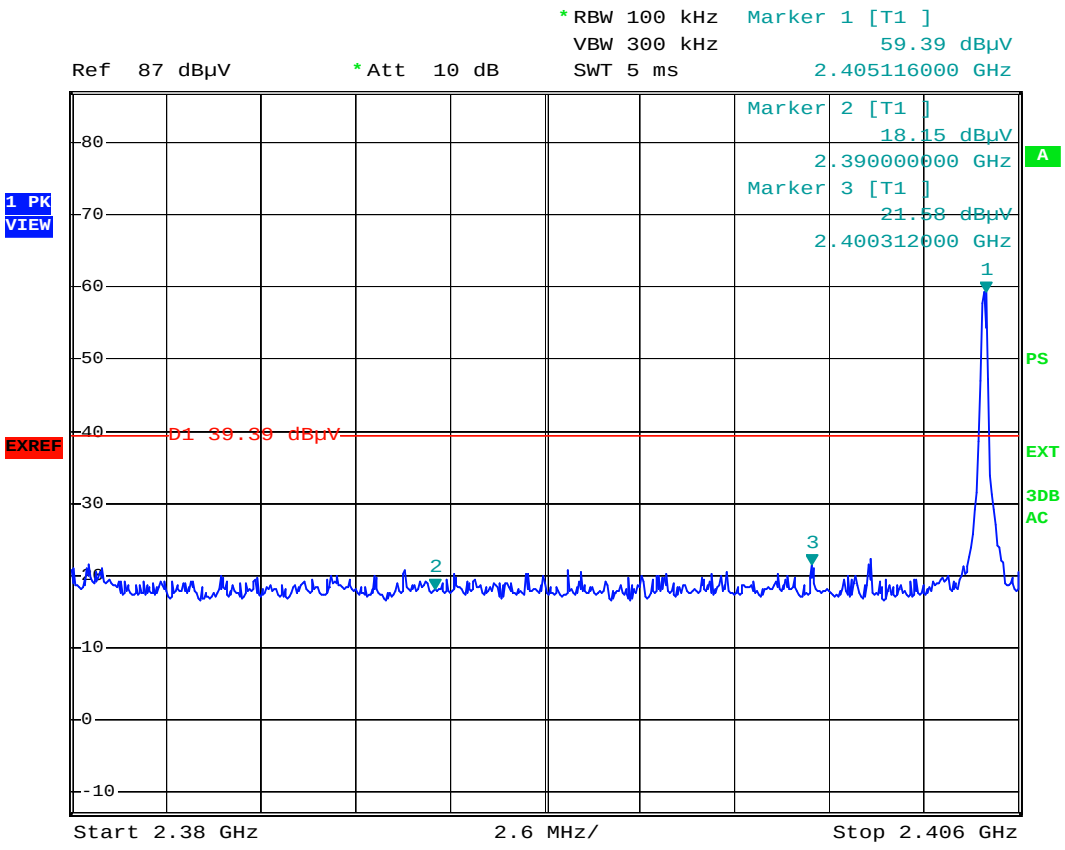

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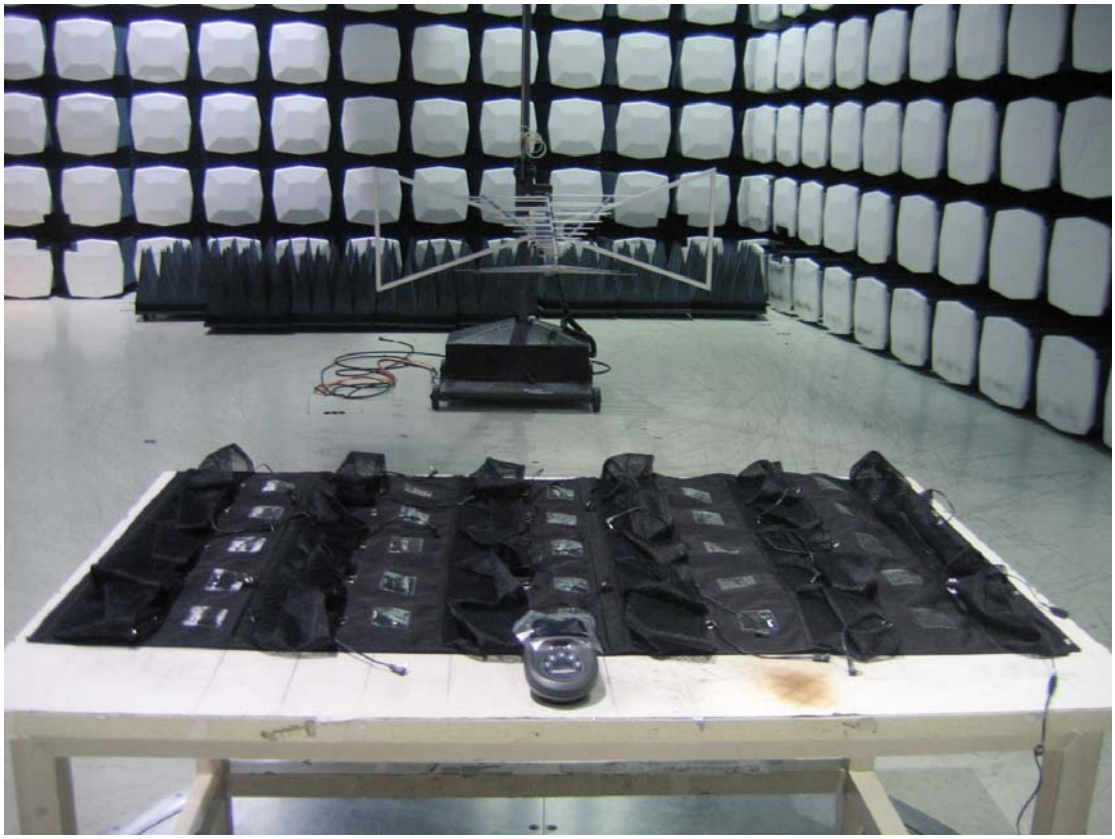
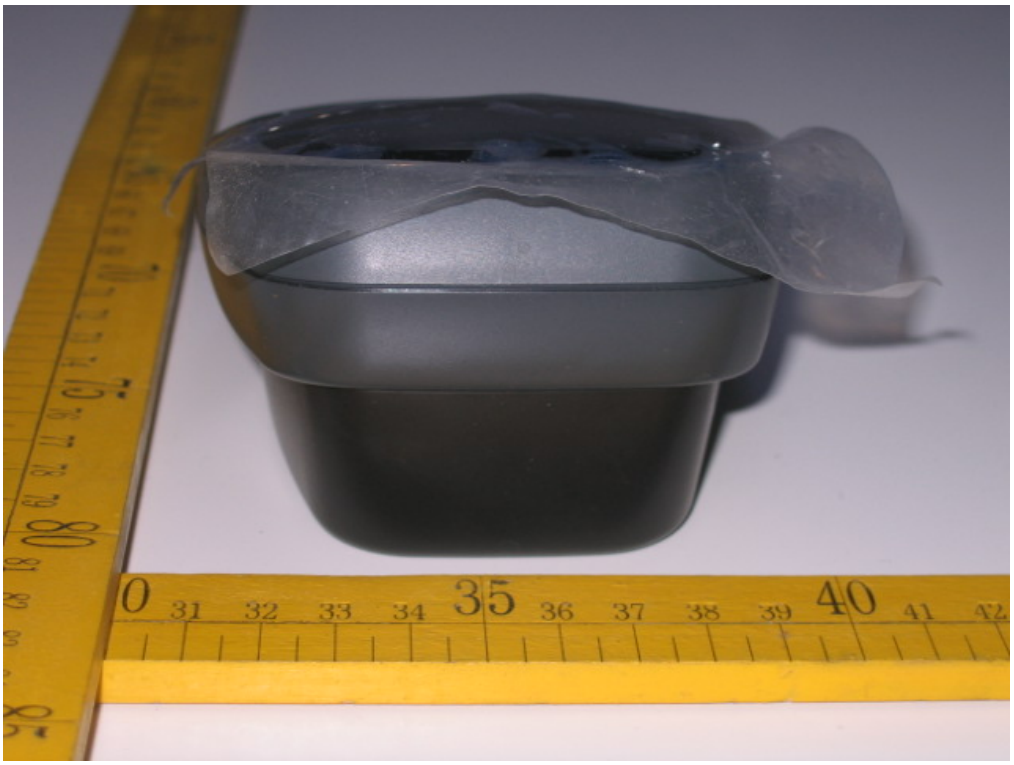
5 Photographs of Test setup



6 Photographs of EUT

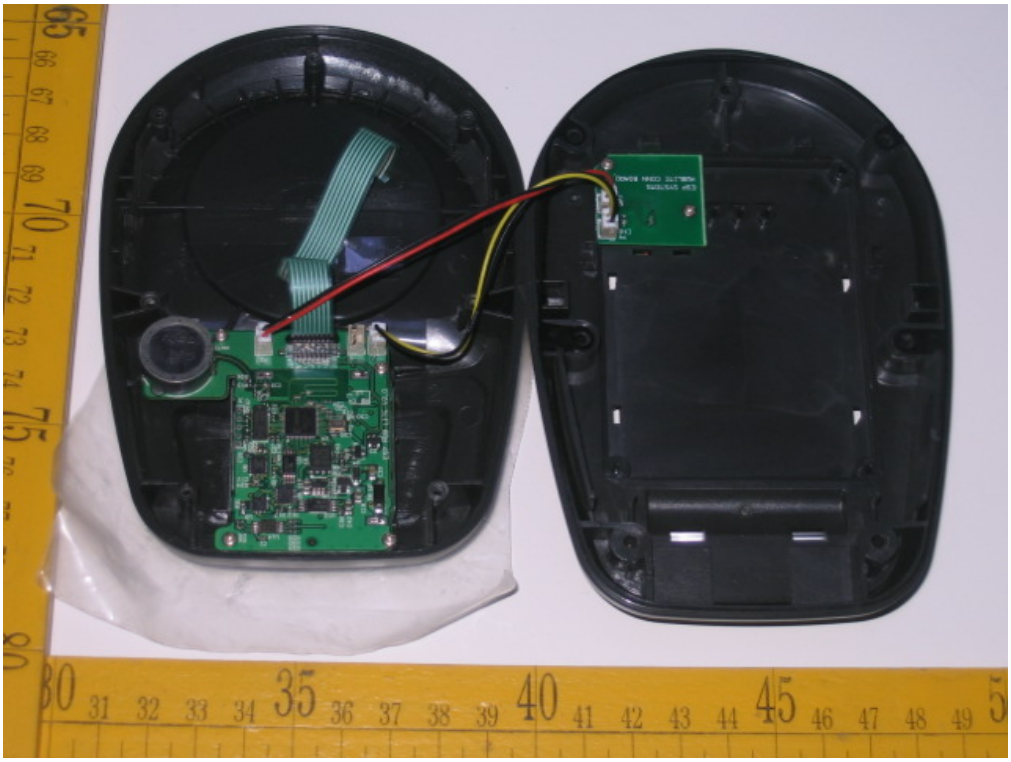
External Photos**:**

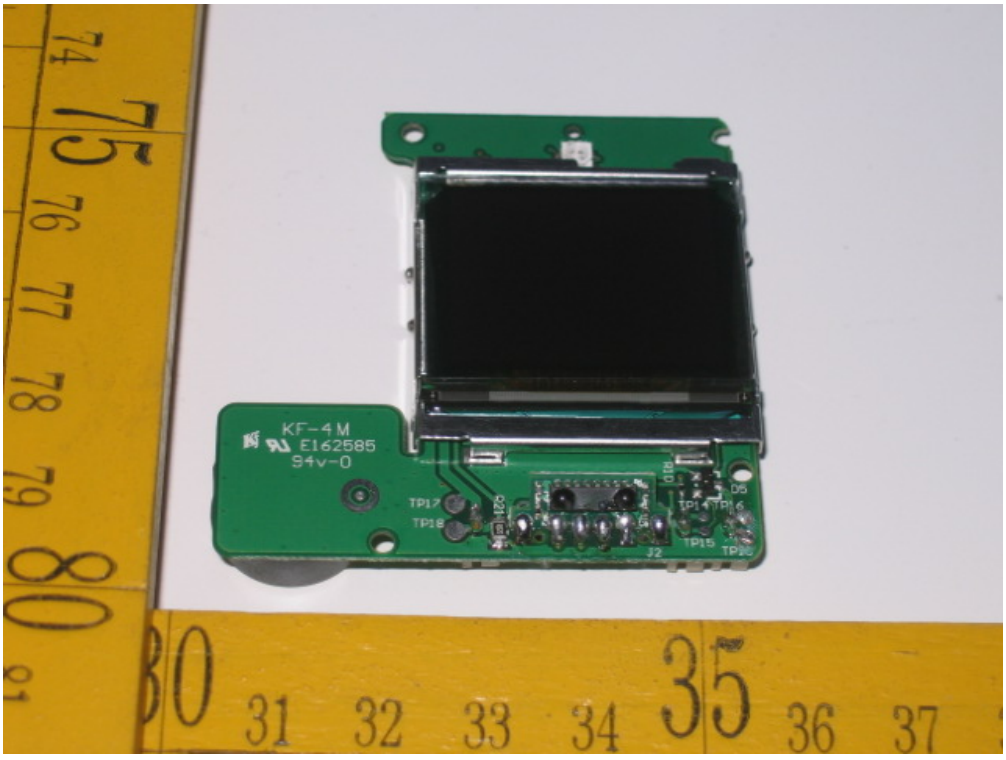

1
2
3
4
5
esp




WARNING

Internal Photos:

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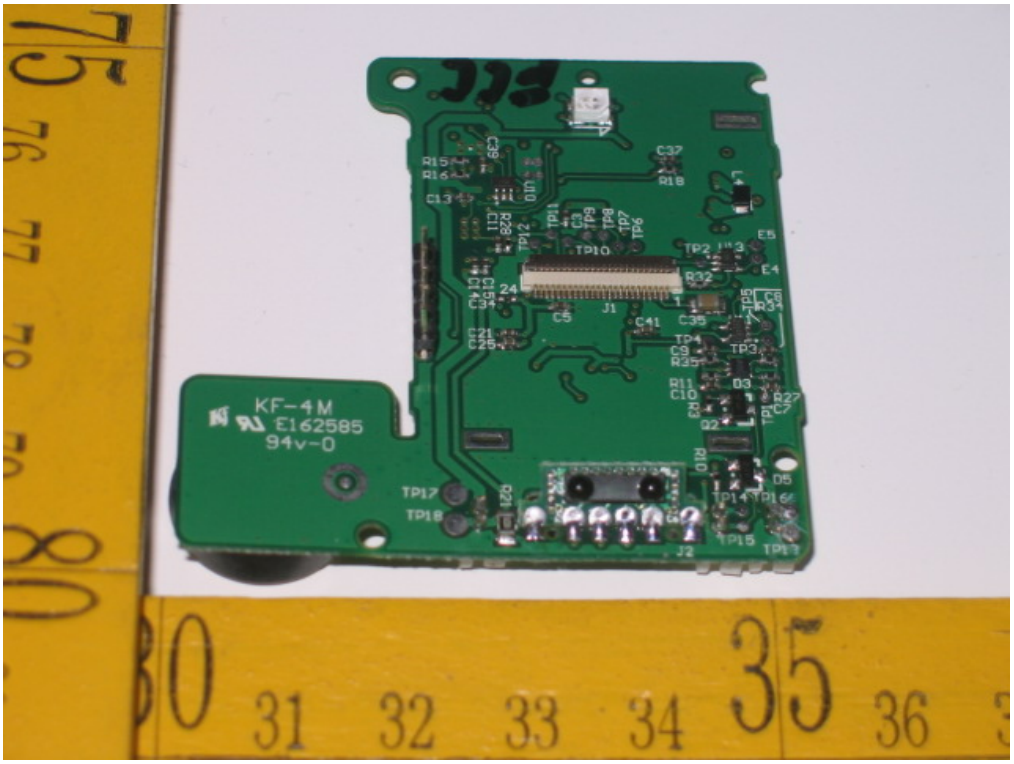
E162585
94v-0
TP17
TP18
TP14
TP16
TP15
J2
D5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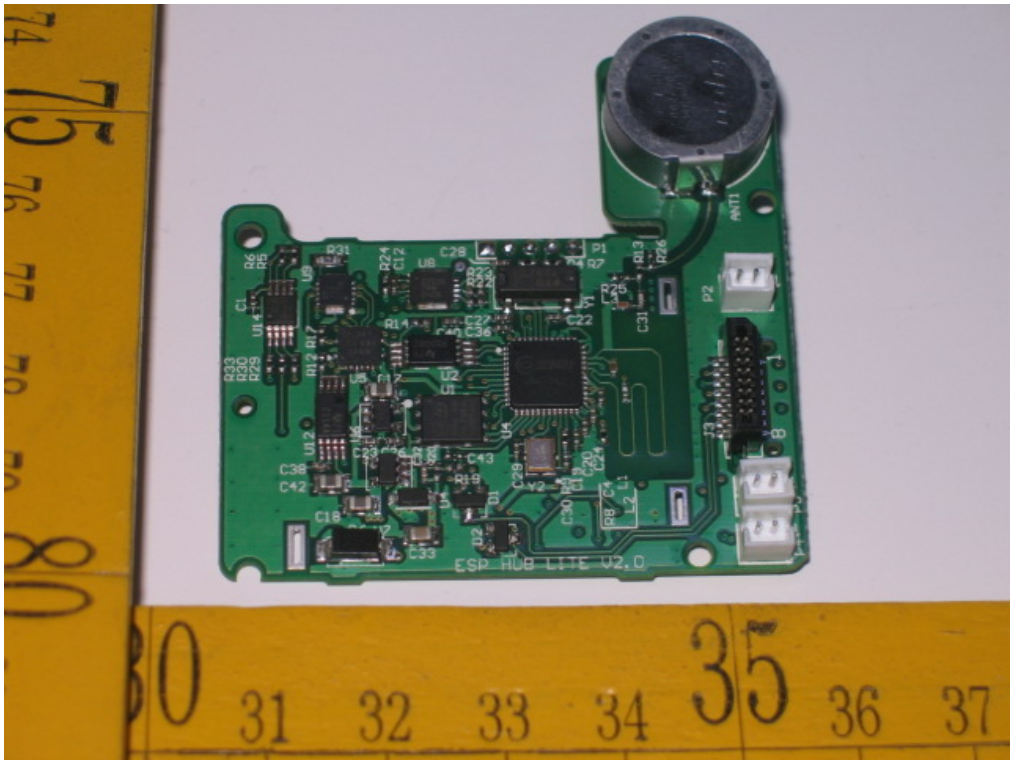
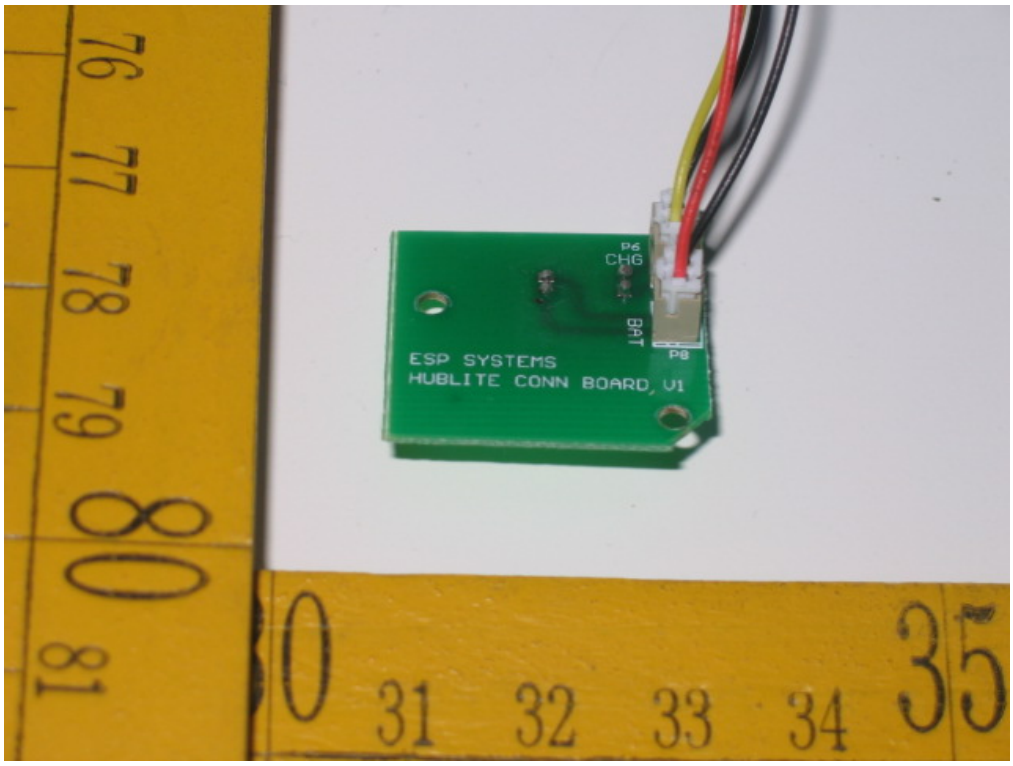
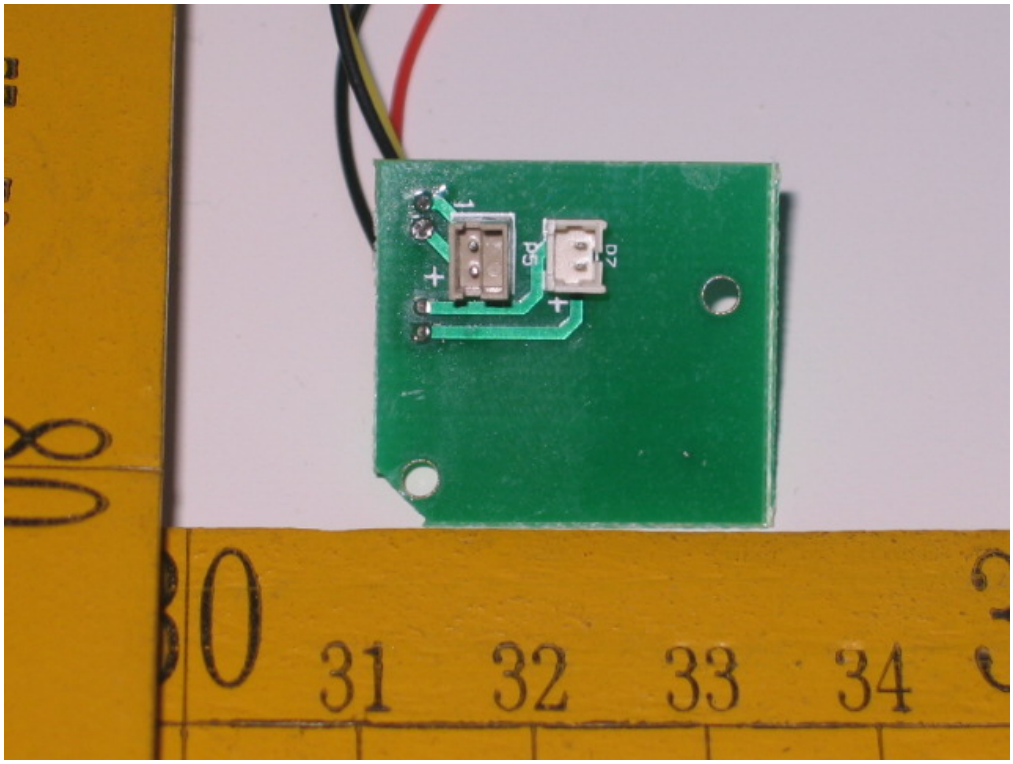
E162585
94v-0


ESP HUB LITE V2.0

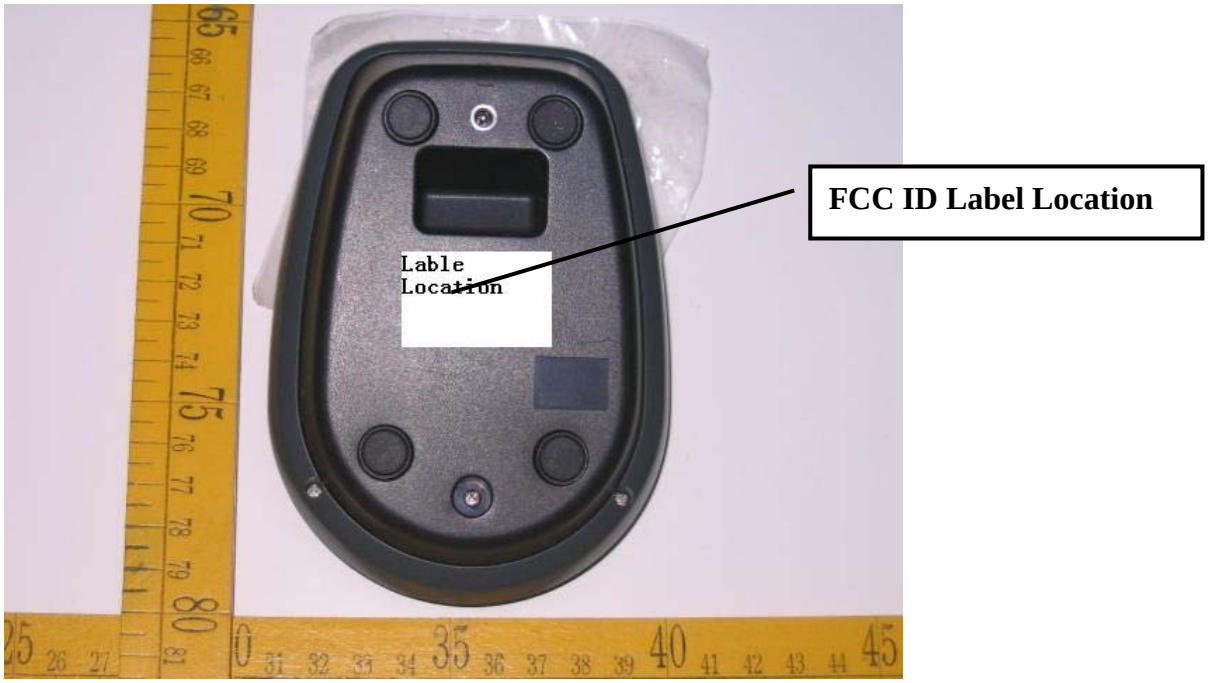

P6
CHG
BAT
P8
ESP SYSTEMS
HUBLITE CONN BOARD, V1


P5
P7

7 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.



END of Report